THE TREATMENT OF SCURVY BEFORE THE NINETEENTH CENTURY

Graham M. Wilson. M.B., Ch.B., M.R.C.P. (Lond. and Edin.)

Brent Knoll,

Kinnear Road,

Edinburgh, 4.

Member of the Class of the History of Medicine, Summer 1947.

CONTENTS

I THE CLASSICAL PERIOD

In the early civilization centred around the eastern Mediterranean, the conditions of life did not impose great hardships on the people. The weather was mild and the temperature equable throughout the year. Thus, the vegetation persisted during the comparatively mild winter and there were no long periods when fruit and wild edible plants were unobtainable. The vessels of the ancient world were essentially rowing ships which hugged the shore and went into harbour at the first sign of rough weather. It is accordingly not surprising that references in classical literature to any condition resembling scurvy are scanty and of doubtful authenticity. Possibly the ancients were aware of the association between an ample diet and the prevention of disease, for, in the Odyssey, Homer (Trans. E.V. Rieu, 1945) wrote:-

> There is an island Syrie.... not so very thickly peopled, though the rich land is excellent for cattle and sheep and yields fine crops of grapes and corn. Famine is unknown there and so is disease. No dreadful scourges spoil the islanders' happiness.

With such stores to draw upon Odysseus' crew, even at sea, suffered from no disorder that might fall into the class of a deficiency disease. The longest voyage

voyage reported in the ancient world was the reputed circumnavigation of Africa, by the Phoenicians under the orders of Neco, King of Egypt, 617 - 601 B.C. They kept close to the shore and apparently took good care to secure fresh provisions. Herodotus (fl. B.C. 460) recorded their methods as follows.

> The Phoenicians setting out from the Red Sea navigated the Southern Sea. When autumn came they went ashore, and sowed the land, by whatever part of Africa they happened to be sailing, and waited for the harvest. Then, having reaped the corn, they put to sea again.

Passing by some writings of Hippocrates which have, on slender evidence, been regarded as describing scurvy, although no treatment is mentioned, we find a certain passage of Pliny the elder (C.Plinius Secundus fl. A.D. 79) which is freely quoted by later writers. Pliny, who in his youth had served in the army in Germany, described an illness amongst the troops of Germanicus Caesar after they had crossed the Rhine. The features of the disorder, attributed to contaminated drinking water, were loss of the teeth, relaxation of the joints of the knees, "stomacace" (disease of the mouth) and "scleroturbe" (disease or, in Galen's view, paralysis of the legs). It is obviously doubtful

doubtful whether this condition really was scurvy. Nevertheless,

> A remedy for them was discovered, however, in the plant known as the "Britannica", which is good, not only for diseases of the sinews and mouth, but for quinzy also, and injuries inflicted by serpents. This plant has dark oblong leaves and swarthy roots; the name given to the flower of it is "vibones", and if it is gathered and eaten before thunder has been heard, it will ensure safety in every respect. The Frisii, a nation then on terms of friendship with us, and within whose territories the Roman army was encamped, pointed out this plant to our soldiers; the name given to it, however, rather surprises me, though possibly it may have been so called because the shores of Britannia are in its vicinity, and only separated by the ocean. At all events, it was not called by this name from the fact of its growing there in great abundance, that is quite certain, for at the time I am speaking of, Britannia was still independent.

Pliny's uncertainty as to the identity

identity of this plant was shared by many later writers and provided the subject for many treatises, and a source of income for at least one doctor. On the nature of this treatment for scurvy Gerarde (1633) wrote:-

> We are not ignorant that in low Germany, this has seemed to some of the best learned to be the true Britannica, and namely to those next the Ocean in Friesland and Holland. The Germans call it Lefflekraut that is, Cochlearia or Spoonwort, by reason of the compassed roundness and hollowness of the leaves, like a spoon; and have thought it to be Plinie's Britannica, because they find it in the same place growing, and endued with the same qualities. Which excellent plant Caesar's soldiers (when they removed their camps beyond the Rhine) found to prevail (as the Frisians had taught them) against that plague and hurtful disease of the teeth, gums, and sinues, called Scurvie, being a deprivation of all good blood and moisture, in the whole body, called Scorbutum; in English, the Scurvie, and Skyrby, a disease happening at sea among Fishermen, and fresh water souldiers, and such as delight

> delight to sit still without labour and exercise of their bodies, and especially above the rest of the causes, when they make not clean their brisket bread from the flour or mealines that is upon the same, which doth spoil many. But this agrees not with Plinies description, and that there may be many other water plants as Nasturtium, Sium, Cardamine, and such others, like in taste, and not unlike in proportion and vertues, which are remedies against the disease aforesaid, there can be no certain argument drawn therefrom to prove it to be Britannica.

Another plant supposed to be the true Britannica, was the great water-dock (Hydrolapathum nigrum). Lind (1772) in a footnote comments; "An infusion of this herb under the name of its essence has for some years past been sold in London as a great specific for the scurvy to the no small emolument of the proprietor, Dr. Hill". This Dr. John Hill was a notorious figure of his time (1716-1775), having a chequered career as an actor, author, botanist, herbalist and doctor. The source from which he obtained his plants was, in the first instance, the Chelsea Physic Garden, but it is stated that he was eventually forbidden its use owing to his depredations. (T.G. Hill, 1913). His

His trade, however, was brisk and he later grew the requisite plants in his own garden where Lancaster Gate is now situated. Variously described as "a good and blustering adventurer","an ingenious man"(by Dr. Johnson) and a M.D. graduate of St Andrews by dishonourable means, there is no doubt that Hill found the treatment of"scurvy" with "the true Britannica" a profitable occupation.

Such was the legacy of ancient times to the therapeutics of this malady.

II. ACCOUNTS OF THE EARLY NORSEMEN AND THE CRUSADERS

After the close of the classical era a long period intervened during which no records relating to scurvy have been found. It is understandable that one should look to the old Norse writings for further information on the treatment of this disease since during the long winter of the northern countries little or no fresh vegetable food would be available; also the Norse are known to have made long voyages to Iceland and Greenland at very early dates under conditions which must have been conducive to the development of scurvy. It is noteworthy that this source of information has been largely neglected by English writers. Furthermore the English word "scurvy" has a Scandinavian origin, though there are many different opinions as to its derivation. As the original Norse word for scurvy, "skyrbjugr" is connected with early Norse views on the causation and treatment of the disease a brief etymological digression may be permitted. Most of this Norse information has been obtained from Reichborn-Kjenneruds (1940).

"Skyrbjugr" was mentioned for the first time in "Thorsteins saga hvita" referring to the period about 900 A.D. and was related to "skyr" which was a sort of sour cow's milk stored for a long time in a cool place. "Skyr" was a drink very commonly used by the Norsemen during voyages, particularly as it kept so

so well. The onset of scurvy was attributed to excessive indulgence in badly made "skyr" and their treatment was based on this assumption. The later word "skorbjug" originated from "skyrbjugr" and eventually appeared in various German forms. The name was evidently carried from the north southwards by sailors visiting the German and Dutch coasts. A corresponding German word "Schorbuk" appeared in Magdeburg in 1404. The old word "Skyrbjugr" also came to the British Isles where the Norse pronunciation "Skyrbue" was first written "Skyrby" or "Scorbie". This later became "Scurvy".

In assessing old methods of treatment it is first essential to make reasonably certain that the disease described really was scurvy. This difficulty has already been mentioned in the extract from Pliny, and it will be encountered later in methods of treatment advocated after Eugalenus had confused the diagnosis of scurvy by his numerous inaccurate descriptions. Several of the outstanding features of scurvy were mentioned in the Sagas. First there appeared bleeding in the skin resulting in red and blue coloured patches. Later ulcers developed and these healed slowly, after becoming heavily infected. The associated bleeding of the gums, stomatitis, and loosening of the teeth, were well recognised. Oedema of the limbs was also mentioned and it appeared the Norsemen thought it was

was caused by "skyr" that was trying to make its way out through the skin. From their descriptions given in sagas referring to the voyages from Iceland and Denmark to Norway it seems reasonably safe to assume that the Norsemen suffered from authentic scurvy.

During Erik Magnusson's campaign against Denmark in 1289 the Bishop Arne fell ill with scurvy on the home voyage. This was attributed to the fact that he refused to touch food which had been looted from Denmark, and he would not eat anything but the bread and butter which had been brought from home. Odd Ravnsson, the doctor with the fleet, who evidently attributed this illness to inadequate food, was thus unable to help the Bishop.

Scurvy was also mentioned in the saga of Erik the Red as occurring amongst people who settled in Greenland and died there. The last mention in the Sagas was in the year 1300, when the Bishop Laurentius, after a last voyage from Iceland, developed scurvy on being taken prisoner in Nidaros (Trondheim). Nothing was said about treatment in these references.

Two other early accounts of diseases that were almost certainly scurvy appeared in writings about the Crusades. Jacques de Vitry (quoted by Hirsch, 1885) described an illness which ravaged the Christian army in front of Damietta in 1218. The outbreak was characterised by swellings of the gums, loosening of the

the teeth and black swellings on the legs. The doctors were unable to find any remedy, but the soldiers who survived to the spring were healed "par l'effet des chaleurs".

The second account is found in Jean de Joinville's biography of St. Louis (Translation. Joan Evans, 1938). The encamped army of King Louis on the seventh crusade was surrounded at Cairo by the Saracens in 1250 and Louis' line of communication with his ships was cut. In consequence the army's diet was chiefly salted pork, (which the Turks did not deign to capture), and eels obtained from the stream flowing through the camp. De Joinville himself suffered, and he reported on the condition of the army:

> We ate no fish in the camp all Lent but eels, and the eels used to feed upon the dead men, for they are gluttonous fish. And for this ill-hap and for the unwholesomeness of the country wherein there never falleth a drop of rain, the sickness of the host came upon us, which was such that the flesh of our legs altogether dried up and the skin of our legs became blotched with black and earth-colour, like to an old boot; and on us that had this sickness

> sickness there grew rotten flesh upon our gums; nor did any man recover from this sickness, but he must come near to dying thereof. The sign of death was this, that when his nose bled, then a man must die.

The condition spread, and the military physicians were unable to deal with it. Finally, therefore the barbers were called upon, and their treatment was ready and rough.

> The sickness began to wax so grievous that so much dead flesh swelled upon the gums of our men that the barbers had to cut it away before the men could chew their meat and swallow it. Pitiful was it to hear the men cry out through the camp from whom they were cutting the dead flesh; for they cried out like women labouring of child.

Scurvy in these early times was by no means confined to seafarers and isolated armies. From unknown times the condition has been endemic amongst the continental people dwelling on the Baltic and North Sea coastlines. The common diet in northern countries consisted largely of salted fish and meat, and, during the long winter months fresh vegetables were unknown. Potatoes were not introduced until the end of

of the eighteenth century. There was little sunlight, much fog, cold and rain, and the houses were damp, dark and confined. It is accordingly not surprising that many traditional cures have been handed down amongst Scandinavian people from very early times. In many cases it is impossible to ascertain the actual date of introduction of different methods of prevention and cure. In view of their interest and antiquity brief mention will be made of some of them.

In the north of Norway fresh buds from fir trees were used against scurvy when nothing else was at hand. A brew was made from the buds and leaves of pines (Turiones pini), though it is recorded that the drink was far from pleasant. King Sverre and his supporters (the Birchlegs) at the end of the 12th century are said to have eaten the leaves and inner bark of birch trees. The leaves constitute one of the richest natural sources of ascorbic acid which has been found in a mean concentration of 218 mgm. per 100 gms of dried material (Rodahl 1944). In the west of Norway it is recorded that the people used rose-hips in the baking of bread, a method with a strangely topical flavour. The Finns used to gather "matsyre" (Rumex acetosa) which was boiled to what they called "syrekal" and eaten in the winter, mixed with milk. It is interesting to note that the Finns were thus relatively free from scurvy, whereas it was commoner among Norwegians.

III. THE DUTCH PHYSICIANS AND THE HERBALISTS

Following the routes of the Old Norse sailors south we find descriptions of the treatment of scurvy in several writings in the Low Countries in the sixteenth century. Euritius Cordus in his Botanologicon, published in 1534, described the use of the lesser celandine (Chelidonium minus) as an antiscorbutic and stated that it was known by the Saxons as "schorbock rout". Olaus Magnus, Archbishop of Upsala, in 1555 described the disease and said that contentment, mirth, and a cheerful disposition of the mind were factors in preventing the illness and that savages prescribed sweating for its cure. He drew attention to the desirability of covering the walls of dwelling-houses with planks, as a preventive measure.

More definite therapeutic measures were described by three outstanding Dutch physicians, Johannes Echth, Baldwin Ronsseus, and Johannes Wier. These writers described the disease as one popularly recognised and amendable to cure by the well-known antiscorbutic herbs such as scurvy-grass, brooklime, water-cress and sorrel. Ronsseus, who was physician to the City of Gouda in 1564 described a large number of herbs and a method of dispensing them in spirit of wine. He remarked that the more simple decoctions of scurvy-grass, wormwood, and germander were the most efficient. The spirit should be well impregnated by repeated infusions of fresh

fresh plants. He also stressed the importance of a good diet and of easy digestion, and the benefit of good air and dry lodgings. A gargle of alum and honey was prescribed for the mouth lesions. Mention was also made of the value of oranges eaten in large quantities and with their skins. They were used by the Dutch seamen in their voyages from Spain. Wier, chief physician to the Duke of Cleves and Juliers, similarly described, in 1567, the use of herbs, which should always be fresh and green when prepared, and he recommended a draught of 4 ozs. of the expressed juices of equal parts of scurvy-grass, water-cress, winter-cresses, or rocket with half the quantity of brooklime, adding a little cinnamon and sugar.

Later in the sixteenth century several German doctors recommended similar methods of treatment with herbs, and also remarked on the importance of a proper diet. Rembert Dodoens in 1578 stressed this last point and referred especially to well-baked wheat bread. Henricus Brucaeus, a professor at Rostock in 1589, in addition to the traditional antiscorbutic herbs recommended horse-radish and the avoidance of dried, long-kept food, smoked and salted foodstuffs. The value of the juices of acid and austere fruits was noted by Solomon Albertus at Wittenburg in 1593. During this period a mixture known as Syr. Sceletyrb. was in use throughout Flanders, Brabant, and Holland. It

It was composed of the juices of brooklime and scurvy-grass boiled into a syrup with sugar, and apparently constituted an effective cure principally used in winter when green plants were not available. This compound was described by Petrus Forestus, a professor at Leyden, in a letter to his brother Jacob written in 1595.

In 1593 the Norwegian doctor Henrik Höyer wrote to the Dutch botanist Carl Clusius in Leyden, that the Norwegians boiled the "multer" berry (Cloudberry or Rubus Chamaemorus) in a bronze casserole which was covered with melted butter in order that the berries should keep better. He stated that this was a more efficient cure for scurvy than scurvy-grass, brooklime, or watercress. It had apparently been known for many hundreds of years by the people in the North of Norway that cloudberries which could be kept throughout the winter, were the best medical food they could eat for the cure of scurvy. Höyer also stated that the Norwegians often used to drive scorbutic patients onto an island where there were many claudberries, and they were not allowed to escape until they were cured of the disease.

There are numerous records of other herbs being used in Norway for the treatment of scurvy. The plant scurvy-grass (Cochlearia officinalis) was long known under the name "Skyrbjuggras", a word which has also similar Swedish, German and Dutch forms. Peder Clauss-

Clausson Friis recorded that people in the north of Norway at the end of the 16th century collected whole boatloads of this plant to preserve it for the winter. Erik Pomtoppidan described how scurvy-grass in western Norway was eaten either raw or boiled in milk. The juice of the fresh plant was also drunk. In the south of Norway it was used as a salad.

One of the first books published in English on the subject of scurvy was the translation in about 1586 of a work by a Frenchman, Jacques Guillemeau, entitled "A worthy treatise of the eyes together with a profitable treatise of the scorbie". Guillemeau was an associate of Ambroise Paré but most of his information has apparently been taken from the earlier Dutch authors and he has nothing original to add as regards methods of treatment. A rather similar book appeared in 1622 written by an Englishman Richard Bannister. It was entitled "A treatise of 113 diseases of the eyes and eye-liddes" and at the end of the book he included "A discourse of the Scorby" which was mainly a summary of Guillemeau's observations. He mentioned numerous methods of treatment and ecommended"milk in which let there be sodden water-cresses or garden cresses which some call winter-cresses whose leaves are broader. Many use with good success scorby-grass, such especially as have been accustomed to eate milke. Let him be kept in a dry, warme, clean and light chamber and let him avoid sorrow".

sorrow".

It is thus apparent that, by the end of the sixteenth century, scurvy, from a practical point of view, was well understood. Accurate descriptions for correct diagnosis as a prelude to treatment were available; the preventive importance of the avoidance of corrupt and salty foods and unhygienic surroundings was realised; and efficient remedies in the form of the antiscorbutic herbs, and lemon and orange juices were at hand. These were the days of absolute faith in the herbs which God had given to every man for the cure of his diseases. Scurvy-grass was the most popular but in the early period was not too well known, only being illustrated in Dodoen's book (1578) in a rather poor reproduction. Wier published a good picture in his tract on scurvy and in 1583 Ronsseus again published the picture (Kleij 1925). Its use was to persist throughout the next two centuries. Dispensation in ale was the favourite English method of administration. Thus Dr. Parry prescribed it:-

> Of the juyce of scurvy grass one pint;
> of the juyce of water-cresses as much;
> of the juyce of succory, half a pint;
> of the juyce of fumitory, half a pint;
> proportion to one gallon of ale; they
> must be all tunned up togather.
> (Camden Society 1868).

Scurvy-grass was an item in the accounts of many

many noblemen in the seventeenth century. Lord William Howard provided "Skirvie grasse for my Lady ijs" (Surtees Society 1877) and the Earl of Bedford paid 4d to John Morrice "for scurvy-grass or gittings to put in the choldren's ale" (Thomson 1937). The Earl's accounts also showed on four occasions an entry of 2/6 on the debit side against " a glass of antiscorbutic juices" for a certain Mrs. Abigail. The interval between her doses varied from four to five days. The season of her illness namely the end of winter, is also worthy of remark. At St. Bartholemew's Hospital the patients received a ration of scurvy-grass ale, provided it was ordered by the doctor and entered in the apothecary's book. (Moore 1918).

Moellenbrock in his book on scurvy-grass, recommended that the leaves of the fresh plant be boiled in milk, whey, wine, beer or water, but cautioned that they ought not to be boiled for long (Moellenbrock 1676). In Scotland, too, the merits of scurvy-grass were recognised in the Flora Scotica of John Lightfoot (1777).

> Cochlearia officinalis. It has an acrid, bitter and acid taste, and is highly recommended for the scurvy. There are instances of a whole ship's crew having been cured of that distemper by it; and as it abounds with acid salts, there can be no

no doubt that it is a great resister of putrefaction. The best way of taking it is raw in a sallad. It is also diuretic and useful in dropsies. The highlanders esteem it as a good stomachic.

Before the close of the seventeenth century a bewildering number of plants had been used for the treatment of scurvy and consideration of the causes which led to the choice of these antiscorbutic plants is of interest. Probably all green plants contain some ascorbic acid and it is now known that in some the quantity is greater than in others. It is obvious, however, that in the past there can have been no deliberate choice of those rich in vitamin C, and the discovery of plants which brought about the cure of scurvy must at first have been the result of trial and error over very long periods. The knowledge of "Britannica" must have been handed down from antiquity to the Friesians who pointed out the plant to the soldiers of Germanicus Caesar, and, in the same way, the value of "Cloudberries" was known to the natives of Norway.

There are several accounts of sailors who, on the verge of death from scurvy, were landed on islands and crawled on their hands and knees to the nearest vegetation which they consumed "grazing like cattle"; the symptoms of these men were rapidly alleviated and they were subsequently picked up completely recovered. In

In north-western Europe Cochlearia officinalis is commonly found on the sea shore and probably this plant was one of those which led to the rapid recovery of these marooned sailors. In this manner, no doubt, it became known to the northern explorers who gave it the name of scurvy-grass. Its popularity as a cure for scurvy largely depended on its edibility and availability for it would usually be one of the first green plants seen in abundance on landing. It was only later that Dodoens (1578) stated that it was grown in gardens. The use of "Turiones Pini" as an antiscorbutic no doubt arose in somewhat the same way; this description probably included both the shoots of Pinus (the pines) and Picea (the spruces) since in the past these were frequently confused. It is noteworthy that at a rather later date spruce beer was often recommended. The use of birch buds by the Norse is probably another example handed down from antiquity.

A number of food plants have been mentioned in the treatment of scurvy but it is probable that their use as food much preceded the discovery of their value as antiscorbutics. Many of these plants belong to the family of the Cruciferae, such as the turnip, cabbage, radish, horse radish, water cress, garden cress, rocket, cardamine and scurvy-grass. Gerarde (1633) mentioned that cress (Nasturtium hortense) was grown in gardens, "and it is eaten with other sallade herbes as

as Tarragon and Rocket and is good against the disease---- called the Scurvie and Scurby, and upon the seas the Skyrby; it is as good and as effectuall as the Scurvie grasse, or water cresses".

Citrus fruits such as the orange, lemon, and lime were well known as antiscorbutics. Fruits belonging to the Rosaceae family, for example the apple, claudberry and rose hip have been used and are known to be rich in ascorbic acid.

Many of the plants mentioned above have a somewhat acrid taste and it is noteworthy that other acid-containing plants such as the water dock (Rumex hydrolapathus) and sorrel (Rumex acetosa) have been recommended. The subsequent use of vinegar and even oil of vitriol in the treatment of scurvy may have arisen from the discovery of the value of these acid plants.

As so often happens in the practice of medicine, even to this day in the case of new therapeutic remedies introduced for a specific disease with initial and conspicuous success, they are later used indiscriminately for all manner of disorders by uncritical observers. In 1588 Severinus Eugalenus, a Dutchman practising in Emden, published a work on scurvy entitled "De Morbo Scorbuto Liber" which was widely studied and accepted throughout Europe and went through seven editions up to 1720. He described a medley of chronic medical conditions bearing no relation to scurvy and

and on which the previously accredited antiscorbutic herbs and fruit juices naturally had no beneficial effect. The general misconception regarding scurvy was shared by many noted doctors in the seventeenth century, including the English physicians Willis, Charleton, Harvey, Lister, Pitcairn, and Hall. Similar misapprehensions were entertained by Hoffmann in Germany and Boerhaave in Holland. As a result, all manner of remedies were introduced which it would be tedious to relate in detail. They included mercury; antimony; milk diet; fixed, volatile, and alkaline salts: tea; coffee; chalybeate springs; Caroline and Selters waters; sulphureous and vitriolic medicines including strong acid of vitriol, to mention only a few. The older Dutch physicians had in general advised against drastic bleedings and purgings, but during the seventeenth century, these are frequently recommended for "scurvy". In general it will be observed that Eugalenus' work had a most unfortunate effect on the therapeutics of this malady amongst orthodox physicians. Other forces, however, were at work which eventually led to a much fuller understanding of the nature and treatment of the disease.

The Place.

Spoonewoꝛte groweth in many places of Holland, and Friſeland, and the countries adioyning about diches and in medowes. In Bꝛabant they ſowe it in gardens.

The Tyme.

Spoonewoꝛte floureth in Apꝛill, May, and afterwardes.

The Names.

This herbe is called in Holand, and Flaunders Lepelcrupt: in French *Herbe aux cuiliers*: in Engliſh Spoonewoꝛte, and accoꝛdingly it is called in Latine Cochlearia: in high Douche Leffelkraut.

The Nature.

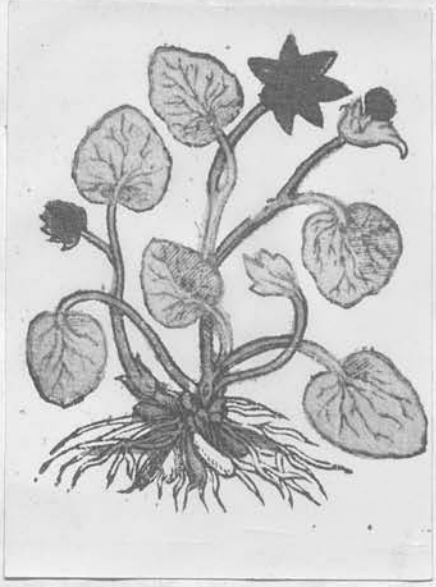
Spoonewoꝛte is hoate & dꝛy, & of a ſharpe & biting taſt, almoſt like kreſſes.

The Vertues.

Spoonewoꝛte boyled in water is a ſinguler medicine, againſt the coꝛrupt & rotten vlcers, and ſtench of the mouth, if it be often waſſhed therewithall. This is alſo a ſinguler remedie againſt the diſeaſe of the mouth called of Hipocrates Voluulus hæmatites, of Plinie Stomacace, and of Marcellus Oſcedo, and of the Hollanders and Friſelanders Scuerbuyck, againſt whiche euill it hath bene lately pꝛoued to be very good, and is in great eſtimation and muche vſed of the Hollanders and Friſeans.

The photographs are reproductions of the figure and textual description of scurvy-grass included in "A Niewe Herbal" the English translation of Dodoen's book (1578) by Thomas Lyte.

Gerarde's illustration of Garden Cress which he recommended for the treatment of scurvy (see page 22).



Chelidonion minus, uulgaris herba, in humidis locis in Maio tantùm conſpicitur. Hinc Germanicè Meykraut. *Saxones* Scorbockskraut/ *Hieronymus* Feigwartzenkraut *appellat.*

The photograph is of the illustration of Chelidonium minus as portrayed in a Latin translation of Dioscorides Book "De Medicinali Materia" published in 1572. The text is an annotation on Chelidonium minus appended by Euritius Cordus. The modern name of this plant is Ranunculus Ficaria, the Lesser Celandine. (see page 15).

Et meritò admiranda ſingularis Dei benignitas, quòd Nordlandiæ longiùs ad Septentrionem remotæ, & fœdiſſimis morbis ob cæli ſoliq; inclementiam miſerabiliter ſcatenti, indigenis remedijs proſpicere voluerit: enim verò morborum crudorum, putridorum, melancholicorum, mira hic ubique ſeges. Idcirco neceſſitas miſeros ruſticanos varia auxilia edocuit, ut nunc vel in graviſſimis caſibus pauperculus aliquis accommodatè ſibi ſuiſq; mederi ſciat. Ita nonnulli ſcorbuticos, quamvis ridiculè, tamen benè atque utiliter hunc in modum curant. In vicinam aliquam inſulam moris abundantem exponunt, ibidemq; ſolos relictos, domum non transferunt, priuſquam ſanitati ſint reſtituti. Tum enim illi, quaſi ab omni humanitate excluſi, vitæ tamen (quod credibile eſt) cupidi, moris iſtis veſci coguntur, ſive ut extremo remedio promiſſam ſanitatem recuperare tentent, ſive ut ſitim quâ ut plurimùm torquentur, extinguant. Dumq; hoc ad ſatietatem agunt, ſine dubio intra paucos dies oppidò convaleſcunt. Hieme verò quando id non licet, electuario ſuo non minùs feliciter utuntur, ſine certâ doſi, aut cuſtodiâ. Aliqui toto curationis tempore, nullo alio alimento utuntur. Hactenus Hoierus.

The illustration and text are taken from Rariorum Plantarum Historia by Carolus Clusius 1601. The plant is Chamaemorus Norwagica, the Cloudberry, and the text is Hóyer's account of its use by the Norse in the treatment of Scurvy as detailed in his letter to Clusius. (see page 17). The plant is now known as Rubus Chamaemorus.

IV. THE INFLUENCE OF HORTICULTURE AND AGRICULTURE

During the seventeenth century there can be little doubt that there was a general change in the incidence of scurvy. The disease remained endemic in the northern Scandinavian countries but further south it was disappearing as a land disease.

Scurvy is a disease which is intimately connected with the general conditions of life of the people and its gradual elimination on land was not so much due to the treatment by individual physicians as to the work of the pioneers in the improvement in horticulture and agriculture. Their efforts contributed to the slow but steady rise in the dietetic standards which were to have such a far-reaching effect on the health of the people in relation to deficiency diseases, and thus their results represented an enormous step forward in social therapeutics. No consideration of the preventive treatment of scurvy would be complete without a brief survey of the improvement in the supply of vegetable food to the people.

The potato, which constitutes a rich source of vitamin C, is a plant indigenous to South America and was introduced into Europe in the latter part of the sixteenth century. We know from Clusius that it was taken from Italy to Belgium and received by the Prefect of Mons who in 1588, sent two tubers to Clusius in Vienna. Clusius, in turn, sent specimens to various Botanic

Botanic gardens in Germany where it made rapid progress. It was grown in Switzerland in 1596 and from there passed into France. Sweden was late in adopting the potato. In all these countries there appeared to have been strong opposition to its introduction and this occurred especially in Russia and Prussia. In the latter country it was the famine caused by the Seven Years War, which finally established its culture.

A monument has been erected to the memory of Sir Frances Drake at Offenburg, Germany, with the inscription "Introducer of the Potato into Europe in 1580". Loudon (1835) however, stated that the potato was first planted by Sir Walter Raleigh in his estate in Ireland. Gerarde planted potatoes in his garden in 1596 but he recommended them "as a delicate dish and not for common food". The English Government through the Royal Society tried to encourage its cultivation in 1663, but progress was slow. Potatoes were mentioned in the Scot's Gardner, Edinburgh, 1683 by John Reid. Only in the eighteenth century did the potato become better known and cultivated in Great Britain.

It is stated in the Statistical Account that potatoes were first known in Scotland in the parish of Kilsyth, Stirling, in 1739 but in a letter by the Hon. Baron Hepburn to Sir John Sinclair, dated 20th March, 1808, it is stated that potatoes were first imported into Leith in 1740 and after that they were for some

some time grown in gardens only, the first field culture being carried out at Aberlady, about 1753 or 1754.

It is noteworthy that the vitamin C content of potatoes diminishes considerably during storage, falling from 28 mgm. per 100 gms in October to 8 mgm. in March. The incidence of scurvy on land was always highest during the early spring months.

The turnip, which is also rich in vitamin C, was also introduced in the sixteenth century. According to Loudon (1835) it is mentioned by Googe in 1586. Gerarde in 1597 and Parkinson in 1629 mention the turnip as a garden vegetable, while Ray in 1686 stated that "they are sown every where in gardens and fields". Trevelyan (1944) has stated that after its introduction as a field crop "The wholesale slaughter of stock at the end of the autumn ceased. Salted meat was replaced by fresh beef and mutton. The immediate result was that scurvy---- grew rare even among the poor". As however fresh meat contains no ascorbic acid the emphasis should rather be placed on the increased availability of vegetables throughout the winter months.

During the seventeenth century the cultivation of gardens was becoming increasingly popular and the habit of eating fresh salads was introduced to the British people. At first the gardens were maintained only by the rich, but later the habit spread to the poorer sections of the community in the country. Thus it

it came about that the English country labourer was able to acquire from his own back garden the herbs which had in the previous century been only available in the physician's concoctions. Similarly the habit of growing cabbages and other green vegetables for human consumption was slowly spreading. At first they were raised only in private gardens and the field cultivation of green vegetables was long delayed. England was far ahead of Scotland in this matter.

The introducers of these new plants and vegetables were not aware of the relation between the outbreaks of land scurvy and the deficient diet of the times. Yet they were chiefly responsible for the preventive measures necessary to eliminate scurvy as a disease of the common people. As will be mentioned later it was only towards the end of the nineteenth century that the incidence of scurvy as a land disease was finally related by medical men to the dietetic habits of the sufferers.

V. THE EARLY VOYAGERS

An early account of the treatment of scurvy is found in Hakluyt's Collection of Voyages (Goldsmid, 1889). James Cartier's crew, after a voyage to Newfoundland in 1535, was severely afflicted with scurvy. The natives, however, were aware of a remedy, as Cartier ascertained from one of his men:

> he asked Domagaia how he had done to heale himselfe; he answered that he had taken the juice and sappe of a certain Tree and therewith had healed himself. For it is a singular remedy against that disease.... Domagaia straight sent two women to fetch some of it, which brought ten to twelve branches of it, and therewith showed the way how to use it, and that is thus, to take the barke and leaves of the sayd tree and boile them together, then drink of the sayd decoction every other day.... the tree is in their language called Ameda or Hanneda, this is thought to be the Sassafras tree. Our Captaine presently caused some of that drink to be made for his men to drink of it, but there was none durst tast of it, except one

> one or two, who ventured the drinking of it, only to tast and prove it; the other seeing that did the like and presently recovered their health and were delivered of that sickness.... so that a tree as big as any Oake in France was spoiled and lopped bare and occupied all in five or six days, and it wrought so well, that if all the physicians of Mountpelier and Lorraine had bene there with all the drugs of Alexandria they would not have done so much in one yere, as that tree did in six dayes for it did so prevail, that as many used of it, by the grace of God recovered their health.

The tree which contributed so remarkably to their recovery is generally regarded as the large swampy American spruce tree (Picea nigra or P.Mariana), which is widely distributed in eastern North America. This tree, however, is an evergreen, and Cartier's notes particularly referred to the fact that the Indians had to wait for the leaves in the spring. Another view is that the tree was Sassafras officinale (Drummond and Wilbraham 1939).

The outstanding contributions of Sir Richard

Richard Hawkins to our knowledge of the prevention and treatment of scurvy at sea have been strangely overlooked by British writers. Even Lind made no mention of his observations. Hawkins, in his "Voyage into the South Sea" (1593), encountered scurvy before he reached the "Aequinoctiall Line". Samuel Purchas in "Hakluytus Posthumus or Purchas His Pilgrimes" recorded Hawkins' advice;

> The best prevention of this disease (in my judgment) is to keepe cleane the shippe.... and especially to shun all kindes of salt fish.... and not to dress any meate with salt water.... to give every man a bit of bread and a draught to drinke, either Beere or Wine mingled with water.... That which I have seene most fruitful for this sicknesse, is soure oranges and lemmons.

Hawkins also records how he acquired a supply of these fruits at the Port of Santos and how

> Many with the sight of the oranges and lemmons seemed to recover heart: this is a wonderfull secret of the power and wisdome of God, that hath hidden so great and unknowne virtue in this fruit, to be a certaine remedy

remedy for this infirmity.

Incidentally Hawkins also described an apparatus for the distilling of sea-water long before Lind's invention and used this water for the treatment of his scorbutic patients at sea. His words are worth recording (Purchas 1625)

> And although our fresh water had failed us many days (before we saw the shore) by reason of our long Navigation without touching any land and the excessive drinking of the sicke and diseased (which could not be excused) yet with an invention I had in my ship I easily drew out of the water of the sea sufficient quantitie of fresh water to sustaine my people, with little expence of fewell, for with foure billets I stilled a hogshead of water, and therewith dressed the meate for the sicke and whole. The water so distilled, we found to be wholesome and nourishing.

Another early adventure in which some interesting observations in the prevention of scurvy are recorded is "The first voyage made to East India by Master James Lancaster, now Knight, for the Merchants of

of London, Anno 1600". James Lancaster the "Generall of the Fleet" had to contend with severe outbreaks of scurvy in three of his four ships, after six months at sea;

> For now the state of the other three was such that they were hardly able to let fall an anchor, to save themselves withall. The Generall went aboard them, and carryed good store of men and hoysed out their boats for them, which they were not able to doe of themselves. And the reason why the Generall's men stood better in health than the men of the other ships, was this: he brought to sea with him certaine Bottles of the juice of Lemmons, which he gave to each one, as long as it would last, three spoonfuls every morning fasting.... By this meanes the Generall cured many of his men and preserved the rest: so that in his ship (having double of the men that was in the rest of the ships) he did not have so many sicke nor lost so many men as they did, which was the mercie of God to us all. (Purchas 1625).

The third voyage to the East Indies commanded by

by William Keeling set out in 1607 and returned in May 1610. With the help of lemon water and occasional supplies of fresh fruit they remained free of scurvy. On the homeward voyage a Dutch ship was encountered with the majority of the crew afflicted with the disease. The Dutch East Indies Company at this period began taking steps to prevent scurvy. They were trying to supply fruit from special ships and had also established a garden at the Cape to grow vegetables.

The contributions of these pioneer British seamen to the treatment of scurvy were of enormous benefit to the development of British overseas commerce. From the first (1600), the East India Company supplied its crews with "lemon water" and oranges. The Royal Navy of Stuart and Hanoverian times was not so protected, and the King's sailors suffered terribly. The long Indian voyages would not have been possible as a means of regular trade if the crews had been much exposed to the ravages of scurvy.(Trevelyan, 1944). John Woodall, who was surgeon general to the East India Company at this time (Jenkinson, 1940) gives,in his book "The Surgeon's Mate" (1617), valuable advice on the prevention and cure of scurvy. In the case of sea scurvy Woodall put his faith in the curative action of citrous fruits.

and further experience teacheth

which I have oft found true, and

and when a disease most raineth, even there God hath appointed the best remedies for the same grefe if it be his will that they should be discovered and used; and note for substance the Lemmons, Limes, Tamarinds, Oringes, and other choyce of good helpes in the Indies which you shall find there doe farre exceed any that can be carried thither from England, and yet there is a good quantity of juice of Lemmons sent in each ship out of England by the great care of the Marchants, and intended for the releefe of every poore man in his neede, which is admissable comfort to poore men in that disease; also I finde we have many good things that heal the Scurvy well at land, but the Sea Surgeon shall doe little good at Sea with them, neyther will they indure. The use of the juyce of Lemons is a precious medicine, and well tried, being sound and good, let it have the chiefe place for it will deserve it.

Woodall has also observed that

Some Chirurgeons also give of this

> this juyce daily to the men in health as a preservative, which course is good, if they have a store, otherwise it were best to keep it for need.

He thus showed that he was aware of the prophylactic value of his favourite remedy.

Scurvy-grass, horse-radish, sorrel and similar herbs were all regarded as useful remedies.

> but marke how far they extend only to the cure of those which live at home, or else it may be sayd, they also helpe some men returned from farre.

He also supported less efficacious methods of treatment

> I can affirm that good oyle of vitrioll is an especiall good medicine in the cure of Scurvy.

Sulphuric acid was to maintain its antiscorbutic reputation for the best part of two centuries. Vinegar was similarly regarded. The early explorers had noticed that the more acid and sourer fruits were more effective in the treatment of scurvy, and thus, presumably, acid drinks were introduced as antiscorbutics. Perhaps if the vinegar had come from a barrel of pickled herrings, it might have contained asmall amount of ascorbic acid and might have had some slight effect (Drummond and Wilbraham, 1939).

Woodall did not himself serve much at sea and

and relied on the sea commanders of his day for most of his information. Early in the seventeenth century it is apparent that effective treatment of scurvy was practised in the merchant ships, and it is interesting to contrast the backwardness of the Royal Navy, a a position that was only to be reversed after the efforts of Lind and Blane. Even in the middle of the eighteenth century Bisset (1755) commented that "the sailors of the merchant ships are seldom much afflicted with the Scurvy even in the long summer passage to Jamaica". But this favourable state of affairs did not continue and the position with regard to scurvy deteriorated considerably in the Merchant Navy at the end of the century.

Two further contributions to the treatment of scurvy at sea was made towards the end of the seventeenth century. Dellon, in 1681, recommended for prevention of scurvy that the ship be kept clean by daily washing with sea water and that the juice of lemons, citrons, and dried fruits be taken for personal prophylaxis. William Cockburn (1696) Physician to the Royal Navy of Great Britain attributed the disease to the sea diet and the lack of "green-trade", and observed that a speedy recovery ensued on eating coleworts, carrots, cabbages, turnips and other vegetables. Cockburn however was considerably under the influence of the teaching of Eugalemus and had little practical

practical experience of the disease. He states that it is "a disease left without remedy at sea" and supports many of the useless treatments in vogue at the time, such as emetics, syrup of althea, aromatic sulphuric acid, squills and vinegar. Though proper methods of treatment were known and available at this period, they were not generally accepted in the Navy. It was not until Lind had demonstrated how effective they were that any change was to occur. Before Lind's contribution is considered, certain observations on treatment, made in a different sphere, remain to be discussed.

It has already been noted that in the more civilised parts of Europe scurvy as a common endemic disease was slowly disappearing as a result of improved conditions of living and of agricultural standards. Extensive experience, however, was still to be gained in the circumstances of war. In 1627 Frederick Van der Mye described an outbreak of scurvy amongst the inhabitants of the beleaguered City of Breda where he was physician to the garrison. He related how the scurvy was relieved in the spring, when green herbs sprang up above the ground. The account is chiefly remarkable for the great importance attached to the maintainance of morale in the treatment of the disease. Lind appended a most interesting footnote on this aspect; "which is too often overlooked in the cure of

of diseases; many of which are sometimes attempted by the sole mechanical operation of drugs without calling into assistance the strong powers of imagination or the concurring influence of the soul".

Another Dutch physician who mainly drew his conclusions from observations on isolated or beseiged armies was Bachstrom. In 1734 he wrote "Observationes circa scorbutum ejusque indolem, causas, signa et curam" He recommended that besieged troops should plant seeds of antiscorbutic herbs on the ramparts, and concluded that a deficiency of green vegetables is altogether and solely the cause of this malady. If they are eaten in quantity, the condition can be both prevented and cured. He also suggested that, in cases of necessity, sailors might make a trial of seaweeds. This is a most interesting observation, for it is now known that Eskimos have, since early times, satisfied up to half their vitamin C requirements from this source. (Høygaard and Rasmussen, 1939). The ascorbic acid content of seaweed varies from 14-45 mgm. per cent. (Rodahl, 1944). Anson's sailors are also reputed to have used this method of treatment.

George Henry Kramer was physician to the Austrian army during the Austrian Turkish war in 1715. Having received little help with regard to treatment from the College of Physicians in Vienna, he proceeded to make his own observations. These were that the disease

disease occurred as the result of a lack of green vegetables or summer fruits, and was quickly cured by scurvy-grass and the juice of oranges. For his soldiers in Hungary he recommended, as a cure, three or four ounces of juice of oranges or citrons taken twice a day in a pint of water with sugar or, preferably, in whey.

It must be realised that considerable prominence has been given, in this account, to those methods of treatment which have subsequently proved their value. This does not mean that they were universably accepted and in general use. Thus, at the middle of the eighteenth century the precepts of physicians working on land were largely followed. Their recommendations were made " rather from a presumption founded on their theory of the disease than from any experience of their effects at sea". The Admiralty accordingly supplied as antiscorbutic stores, malt and a malt extract, vinegar, aromatic sulphuric acid, salted cabbage, beer and molasses. This method was only effective for the short period that the beer ration lasted, at the rate of seven pints per man per day. At this period the position with regard to the treatment of scurvy was chaotic. Naval surgeons, and seafarers generally, knew the value of fresh vegetables and fruits, but the leading physicians of the day did not support these methods of treatment and, in view of this divided

divided medical opinion, the Admiralty officials were unable to decide upon effective measures of prevention in naval ships at sea. It fell to James Lind to clear up this chaos and to place the treatment of scurvy on a sound basis.

VI. THE CONTRIBUTION OF JAMES LIND

Lind was born in Edinburgh in 1716, and after some instruction at the University of Edinburgh, joined the naval medical service in 1739, serving until 1748. He went on voyages to the Mediterrean, Guinea Coast and West Indies and gained considerable knowledge of scurvy at sea. In 1748 he graduated M.D. Edinburgh, and became F.R.C.P.E. in 1750. From 1758 to 1783 he was physician to the naval hospital at Haslar where he gained an extensive practical experience in the treatment of scurvy. In his first two years there he dealt with 1146 cases of the disease. The Channel fleet sometimes put into Portsmouth with one or two thousand scorbutic patients aboard and during the Seven Years War with France and Spain there were usually 300 to 400 cases in hospital, and even 1000 at one time. He made full use of this vast experience of the malady. His "Treatise of the Scurvy" was written in Edinburgh after he had left the navy, and it was published in 1753. A second edition, entitled a "Treatise on the Scurvy", appeared in 1757, and a third, enriched by his experience at Haslar, in 1772.

In his chapters on prevention and cure, he stated "I shall propose nothing dictated merely from theory; but shall confirm all by experience and facts, the surest and most unerring guides". He then proceeded to detail in the most comprehensive manner all the

the necessary measures for dealing with scurvy at sea, avoiding, " offering anything that may be judged impracticable, or liable to exception, on account of the difficulty or disagreeableness of complying with it".

For prevention of the disease on land he recommended dry, cheerful, well-aired dwellings, a diet of easy digestion chiefly of a due mixture of animal and vegetable substances, and including plenty of recent greens, besides a daily glass of good sound beer, cyder, or wine. He also stressed the importance of moderate exercise, cleanliness of body, and contentment of mind procured by agreeable and entertaining amusements. Turning to the question of prevention at sea, he emphasised the importance of putting methods of prophylaxis into practice early, "it being found that almost all diseases are easier prevented than removed". Lime water, spirit of sea salt, elixir of vitriol and vinegar were found not sufficient to prevent the disease. By carefully controlled experiments the use of oranges, lemons, and lemon juice was shown to be the most efficient method of prevention at sea. These results were confirmed by reports of his colleagues who had used his methods. An extract or "rob" of lemons, suitable for carrying at sea, was described and instructions were given for its preparation. "When made in a proper place and season it will come very cheap; and our navy may be supplied with it at a much easier

easier rate than anything as yet proposed". If lemon juice was not available, most berries and fruits were suitable for the control of scurvy, as also were green vegetables. Methods of preservation for use at sea were suggested and the sowing of cress seeds while on a long voyage was also proposed. Cyder and spruce beer were mentioned as suitable preventives.

Although Lind knew nothing of the increased metabolism of ascorbic acid during fevers, he realised that men convalescing from other illnesses were peculiarly liable to develop scurvy, and that prevention depended especially on a careful regulation of diet and exercise. While the convalescent was still very weak, he should receive a diet of freshly-baked bread boiled in water to which a few drops of lemon juice and a spoonful of wine have been added. "A caution is here requisite, that to convalescents nourishment should be given often but in small quantity at a time". The addition of orange and lemon juice to their food and drink was required. With regard to exercise, the rule was to proportion the continuance and degree of it to the strength and condition of the patient, to begin with the most gentle and easy at first, and to proceed gradually to the more violent.

Attention was drawn to the necessity of improving general conditions at sea, in order to reduce the incidence of scurvy. Proper heating of the ship and

and avoidance of damp were important points. Sailors should be well clothed, have frequent changes of dry linen, and pay proper attention to personal cleanliness. Their bedding should be kept dry and not be rolled up until it has been sufficiently aired. Finally, a decent supply of fresh water, to which extract of lemons might be added, must be ensured and the food at sea must be correctly preserved.

The measures for the cure of an actual case of scurvy were chiefly dietetic. The food should be light and of easy digestion, and should consist of broths and soups made with fresh meat and plenty of vegetables, such as cabbages, coleworts and leeks. Salads of any kind were beneficial, especially those containing sorrel, endive, lettuce, purslain, scurvy-grass and cresses. Fruits such as oranges, lemons, citrons, and apples should be taken. For drink good sound beer, cyder, or Rhenish wine was recommended. Locally a gargle of alum in water, or barley-water and honey of roses acidulated with some of the mineral acids, was suitable. Warm fomentations might be applied night and morning to the legs. He commented that there was no great occasion for medicines. Mercury and antimony did manifest harm. Bleeding and violent purges wre to be avoided and the danger of moving a seriously ill scorbutic patient must be realised.

Also, after a long abstinence from

> from greens and fruits a patient should be treated like one almost starved to death; that is, not permitted for a few days to eat voraciously or surfeit himself with them; otherwise he may be apt to fall into a flux which often proves mortal.

Furthermore, a long period of treatment was required for all scorbutic patients, for relapses were common if treatment was curtailed.

In the postscript to his third edition Lind made some observations on the treatment of cases of scurvy, which developed even in the presence of a diet containing green vegetables. He commented on the appearance of the disease amongst men who had just returned from a long voyage, apparently fit but who became afflicted with scurvy while living at Portsmouth on a diet containing greens. He also described outbreaks in Haslar Hospital itself amongst patients who were living on fresh beef, soup, and greens. These comments are especially interesting in view of the experience gained in feeding large bodies of troops during the recent war. The ascorbic acid content of green vegetables was, in these recent times, shewn to be greatly reduced by improper methods of preparation, cooking and serving. Nor was Lind fully aware of the importance, on a deficient diet, of the latent period

period before frank signs appeared. That this interval depended on the previous diet of the seamen and partially explained the irregularity of the outbreaks, was subsequently realised by Gilbert Blane.

It will be readily appreciated that Lind's recommendations for the prevention and treatment of scurvy are essentially the same as those in force at the present day. Nevertheless, his chief claim to fame does not rest so much on the curative methods which he employed as on his original approach to the problem and his introduction of the experimental method into the therapeutics of this disorder. His investigation, at first hand, of earlier writings was something that had never previously been attempted and he appealed, especially in the Appendix, for further information on the literature. This constituted a most valuable step in sifting out the inaccurate methods and descriptions that were so prevalent, and that formed a barrier to correct diagnosis and treatment.

> His therapeutic recommendations are based not only on his general clinical experience, but on exact comparative observations carried out on patients, in hospital under different remedies, a method which must have been a novelty at the time. (Stockman 1926).

VII. THE CLOSE OF THE EIGHTEENTH CENTURY

After the publication of Lind's work the chief task that remained from a practical point of view was the enactment of regulations for the prevention of scurvy which would incorporate his advice. He died forty-one years after the publication of his book but did not live to see his recommendations carried out on a large scale. Individual commanders were undoubtedly greatly impressed by his work. For instance, Captain Cook gathered a well-earned reputation for the care he took of his seamen. In his voyage to the South Pole he was

> absent from England three years and eighteen days, in which time, and under all changes of climate I lost but four men, and only one of them by sickness.

For the prevention of scurvy, he chiefly relied on sweet wort, sour krout and portable broth. The last was "the means of making the people eat a greater quantity of vegetables than they otherwise would have done". Cook, however, stated, "rob of lemon and orange is an antiscorbutic we were not without. The surgeon made use of it in many cases with great success". Sir Joseph Banks travelled with Cook on the voyage of the Endeavour round the world in 1768, and the following extract from his journal showed his appreciation of

of lemon juice as a treatment for scurvy, (J.D. Hooker 1896);

> The ship was supplied by the Admiralty with sourkrout, of which I eat constantly, till our salted cabbage was opened, which I preferred; as a pleasant substitute, wort was served out almost constantly, and of this I drank a pint or more every evening, but all this did not check distemper so entirely as to prevent my feeling some small effect of it. About a fortnight ago my gums swelled, and some small pimples rose on the inside of my mouth, which threatened to become ulcers; I then flew to the lemon juice, which had been put up for me according to Dr. Hulme's method, described in his book, and in his letter, which is inserted here. Every kind of liquor which I used was made sour with lemon juice No.3, so that I took nearly six ounces a day of it; the effect of this was surprising, in less than a week my gums became as firm as ever, and at this time I was troubled with nothing but a few pimples on my face, which have not deterred me from leaving off the juice entirely.

entirely.

The letter read as follows:-

To J. Banks, Esq., Burlington Street.-

Sir- The vessels containing the orange and lemon juice, sent by Dr. Fothergill, were to be marked, that you might know their contents; but lest in the hurry of sending them that circumstance should have been neglected, I will take the liberty to explain them.

The large cask, No.2, contains seven gallons of orange juice and one gallon brandy. The small cask, No.3, contains five quarts of lemon juice and one of brandy.

Not all naval commanders were so enlightened as Cook, and scurvy continued to rage at sea till the end of the century. The delay in instituting a regular lemon juice ration is surprising, but it seems that the medical schools and teachers clung obstinately to traditional methods of treatment. Even naval medical officers were slow in grasping the full significance of Lind's work. Thus, no less a person than Gilbert Blane (1799) was unable to prevent outbreaks of scurvy in the West Indies Fleet in 1781 and 1782. Much of the confusion that reigned during this period was undoubtedly due to the number of antiscorbutic substances

substances that Cook carried on his ships. Each writer, in the absence of any careful control, claimed Cook's success as proof of the efficacy of his method of treatment. Thus the Admiralty continued to issue wort or malt extract, as advocated by Macbride (1767), largely on account of its cheapness. Cook, also, at one time reported rather unfavourably on the "rob" of lemons and oranges which had been used on Lind's recommendation. (Pringle, 1776). This failure was largely due to faulty preparation of the "rob". There is no doubt that on many occasions the lemon juice was treated in such a manner that its ascorbic acid content was greatly reduced. Thus, many physicians and seafarers acting on Lind's advice were disappointed by the results obtained, and the universal acknowledgement of the beneficial effects of lemon juice was long delayed. It was, however, realised by one doctor that the method of concentration of the juice might explain the variable responce to treatment.

> Beside the water carried off by vapour from this preparation, we know not what other changes it may undergo by heat; and it likely by that means loses what we would most value it for.

This was a remarkably accurate statement by Trotter (1786). As a result of this uncertainty regarding the better antiscorbutics several useless and extraordinary

extraordinary methods of treatment continued in vogue during the century. Perhaps the most amazing was that of Dr. Mead (1749) who held that the vapour of cold earth was a cure for scurvy. The patient was accordingly held over a hole in the ground after a slice of turf had been removed. Admiral Sir Thomas Pasley improved on this method by burying affected seamen in his garden "greatly to their satisfaction". (R.M.S. Pasley 1931). The use of salt was frequently associated with either the causation or treatment of scurvy. Some thought that the salt used for the preservation of food might be the cause of scurvy. Improvement of this salt was regarded as a method of preventing the disease. (Lowndes 1746). Others considered that drinking salt water was beneficial. "Salt-water is useful in the Scurvy, not as an evacuant only, but also as an antiseptic". (Addington 1753).

In addition to the employment of the valueless methods of treatment already mentioned, regulations were made to provide articles having in their fresh state, as we now know, a fair content of vitamin C. Sourkrout, recommended by Lind and Cook, was used as an experiment by the Admiralty but was ineffectual largely owing to bad pickling. "On opening the casks which hold the krout an effluvia flies off, which is so intolerable as to smell fetid and disagreeable at many yards distance". (Trotter 1792). Similarly, the

the "essence of spruce" issued to a few naval ships was prepared in such a way that it was valueless as an anti-scorbutic. In the navy, not only were the preparations faulty but the regulations for the supply of fresh vegetables were not carried out properly. The Admiralty in 1757, issued an order that "all commanders are to take care, that their respective Pursers do comply with what is contained in the said Memorial, by furnishing a sufficient quantity of Roots and Greens to Seamen..." But the pursers rarely issued full rations in those days and many naval commanders took little interest in the diet of their men. Forty years later, at the Spithead naval mutiny, the seamen still complained about the lack of a sufficient supply of vegetables.

The first effective steps to eliminate scurvy from the Royal Navy were taken at the end of the century, chiefly as the results of the efforts of Blane and Trotter. In 1795 the Admiralty finally decided to sanction a lemon juice ration as the principal antiscorbutic measure, but it was several years before such a ration was universally distributed. The allowance was originally fixed at one ounce, to be issued in the ships which received this ration. Blane (1830) claimed that the disease was totally rooted out within two years, but this was undoubtedly an over-optimistic statement (A.H. Smith 1919), for crews still had to threaten mutiny in 1797 in order to ensure their supply of lemon juice.

juice. Numerous other changes were assisting in the reduction of the incidence of scurvy, particularly the increasing use of vegetables, and fresh meat, the improvement in seamen's living quarters, and the introduction of cleaner and faster ships. Trotter (1803) was chiefly responsible for the improvement in the supply of green vegetables and should receive considerable credit for this fundamental approach to the problem.

As a result of these measures there is no doubt that in the Royal Navy scurvy was becoming a disease of the past. Trotter in 1803 stated "that a case of scurvy requiring to be sent to hospital has not come under my observation since 1795". The position in the Merchant Navy was considerably less satisfactory, but the lack of effective prevention and treatment in the service cannot be attributed to ignorance of the medical measures required. Over two hundred years previously Hawkins had written of scurvy (Purchas, 1625)

> then I leave the remedies thereof to those Physicians and Surgeons who have experience. And I wish that some learned man would write of it, for it is the plague of the sea and the spoyle of mariners: doubtless it would be a work worthy of a worthy man, and most beneficiall for our Countrie, for in twentie yeares (since I have used the sea) I dare

> dare take upon me to give account of ten thousand men consumed with this disease.

By the end of the eighteenth century Hawkins' wish had been fulfilled. Many worthy men had written of the disease and the "plague of the sea" was being brought under control.

On the land the position at the close of the century is more difficult to ascertain, but notable advances had been made. As a result of the work of Bachstrom and Lind the artificial distinction between sea and land scurvy had been removed and it was realised that the condition on land responded to therapeutic measures similar to those employed at sea. The statistical account of Scotland (Sinclair, 1791) referred to scurvy in many parishes, but the cause of the condition and its treatment were apparently becoming recognised at this period. Thus in Shetland:

> The most common distempers are the scurvy, which is not to be wondered at, as the people live on fish and flesh and use very little vegetable food.

In the country and particularly in these northern parts the eradication of scurvy was being achieved not so much by the efforts of individual physicians, as by general education of the people in improved agricultural methods. The great advance from a medical viewpoint

viewpoint was the more widespread realisation in many countries of the relation between diet and scurvy and the importance of ensuring an adequate supply of green vegetables during the winter months. Thus Munro (1764) in his account of scurvy in Canada in 1760 and at Bremen in 1762 stated that the disease was most frequent in those northern countries where fresh vegetables were scarce and the inhabitants were obliged to live much on salted provisions during the winter. For this reason the malady was common in Quebec during the first winter of its occupation by the English, as well as in several other forts in America which were captured so late in the season that the troops had no time to lay in a store of green vegetables. At Bremen the disease occurred amongst the soldiers only who, in contrast to the officers and civilians, were unable to procure vegetables and fruit in the market. It was especially among troops overseas that scurvy tended to become prevalent, for the labouring classes and country people were learning better how to provide for themselves.

VIII. CONCLUSION

Thus, in a brief survey of what has gone before, it will be seen that sufferers from the disease of scurvy have fared in similar fashion to the victims of most other diseases through the centuries. Here and there a physician or layman has had the powers of observation and the acumen to find an effective remedy for what must have been a very prevalent disease in the days of widespread war, destruction, and famines in the northern continent of Europe. However, tales passed from mouth to mouth of methods, accounted by their retailers as exclusive and certain on no other evidence than hearsay, proved more acceptable than the observations of those with intimate personal knowledge of the disease. Men had only themselves to thank for the delay which occurred between the first attempts at cure and the final and better understanding of scurvy with proper organisation for its treatment. It is perhaps idle to express surprise at the lack of initiative in the introduction of suitable therapeutic remedies during the last part of the 18th century. We need only look to the incidence and preventive treatment of bovine tuberculosis in our own day for a parallel.

As with many other advances in all spheres of scientific endeavour, Hardship as experienced in the great explorations of the 16th, 17th, and 18th centuries, and War throughout the ages have proved to be the

the strongest stimuli to experiment and to advance. Nor is it remarkable that the Dutch physicians in the 16th century should have contributed so much to further discovery and practice in the treatment of scurvy. During that period their culture and tolerant progressive spirit were of inestimable value to Europe in many other fields than medicine. They also had the advantage of endemic experience of the disease and of knowledge of its possible causation from their adventurous trading seamen.

However, when the expansion of British trade took our ships and men-of-war on dangerous and important missions over vaster distances than had ever been dreamt of hitherto, greater knowledge of the disease of scurvy, and greater certainty of method for its cure, were demanded by necessity. Men of invention and genius were forthcoming, and principally from Scotland. Blane was a graduate of Glasgow University, while both Lind and Trotter came from Edinburgh University. As a result of their efforts frank scurvy was to become a clinical curiosity, so well had they ascertained the means of relief of a disease which had long been the scourge of the ages.

IX. SOURCES AND ACKNOWLEDGEMENTS

It has not been possible to consult all the early authors mentioned in their original works owing to the language difficulties and limited numbers of copies of the older books. The writers whose books were not seen in the original are marked with an asterisk in the list of references and in these cases it has been necessary to rely on the abstracts given by Bannister (1622), Kleij (1925) Hirsch (1885) and Lind (1772). The article of Reichborn-Kjenneruds (1940), written in Norse which I am unable to read, was kindly abstracted and translated by Rodahl (personal communication). With these exceptions all the authorities cited have been consulted in the original.

I am deeply indebted to the following libraries for assistance with books - University of Edinburgh, Royal Society of Medicine, Royal Medical Society, Royal College of Physicians of London, Royal College of Physicians of Edinburgh, the British Museum, and the Royal Botanic Garden, Edinburgh.

IX. REFERENCES

ADDINGTON, ANTHONY, (1753). An Essay on the Sea Scurvy.

*ALBERT, SOLOMON, (1593). Scorbuti historia proposita in publicum.

ANSON, GEORGE, (1776). A voyage round the world compiled from his papers by Richard Walter.

*BACHSTROM, JOSEPH F. (1734). Observationes circa scorbutum.

BANNISTER, RICHARD, (1622). A treatise of 113 Diseases of the Eyes and Eye-liddes.

BISSET, CHARLES, (1755). A treatise on the Scurvy designed for the use of the British Navy.

BLANE, GILBERT, (1799). Observations on the Diseases of Seamen. 3rd. Edition.

(1830). A Brief Statement of the Progressive Improvement in the Health of the Royal Navy.

*BRUCAEUS, HENRICUS, (1589). De scorbuto propositiones.

CAMDEN SOCIETY, (1868). Publication No.99. Diary of John Manningham 1602-3.

COCKBURN, WILLIAM, (1696). Sea-Diseases; or a treatise of their nature, cause, and cure.

COOK, JAMES, (1777). Voyage to the South Pole.

*CORDUS, EURITIUS, (1534). Botanologicon.

*DELLON, M., (1681). Une voyage aux Indes orientales.

DODOENS, REMBERT, (1578). A niewe Herbal translated by H. Lyte.

DRUMMOND, J. and WILBRAHAM, ANNE, (1939). The Englishman's Food. A History of five Centuries of English Diet.

*ECHTH, JOHANNES, (1541). De scorbuto epitome.

EVANS, JOAN, (1938). The History of St. Louis by Jean, Sire de Joinville.

GERARDE, JOHN, (1633). Herball or General Historie of Plants (2nd. Edition).

GOLDSMID, EDMUND, (1889). Hakluyt's Collection of Voyages.

*GUILLEMEAU, JACQUES, (1586). A worthy treatise of the eyes together with aprofitable treatise of the scorbie.

HERODOTUS (B.C. 460 appr.). Melpomene, IV, 42.

HILL, T.G. (1913). in Makers of British Botany ed.F.W. Oliver.

HIRSCH, AUGUST, (1885). Handbook of geographical and historical pathology Vol. II. Translated from the second German edition by Charles Creighton.

HOOKER, JOSEPH, D. (1896). Journal of the Right Honourable Sir Joseph Banks.

HØYGAARD, ARNE and RASMUSSEN, H.W. (1939). Vitamin C sources in Eskimo Food. Nature 143:943.

JENKINSON, S. (1940). John Woodall, Surgeon, Royal Navy 1569-1643. Jour. Roy. Nav. Medical Service, XXVI, 105.

KLEIJ, J.J. Van der (1925). Over Het Bekend Worden Van De Scheurbuik in de Nederlanden. Nederlandsch Tijdschrift Voor Geneeskunde 1925, ii, 1573.

*KRAMER, G.H., (1737). Dissertatio de scorbuto.

LIGHTFOOT, JOHN, (1777). Flora Scotica.

LIND, JAMES, (1753). Treatise of the Scurvy.

(1772). Treatise on the Scurvy (3rd. Edition).

LOUDON, J.C. (1835). Encyclopedia of British Agriculture.

LOWNDES, T. (1746). Brine salt improved, or the method of making salt from brine that shall be good or better than French Bay Salt.

MACBRIDE, D., (1767). Experimental Essays (1V on the Scurvy).

*MAGNUS, OLAUS, (1555). De gentium septentrional.. conditionibus.

MEAD, R., (1749). A Discourse on Scurvy.

MOORE, NORMAN, (1918). History of St. Bartholomew's Hospital.

MOELLENBROCK, A.V. (1676). Cochlearia Curiosa or the Curiosities of the Scurvy grass written in Latine by Dr. Andreas Valentinus Molimbrochius. Englished by Thos. Sherley.

MUNRO, DONALD, (1764). An account of the diseases most frequent in British military hospitals.

PARKINSON, J. (1629). Paradisi in sole. Paradisus Terrestris.

PASLEY, R.M.S. (1931). Private Sea Journals 1778-82 kept by Sir Thomas Pasley.

PLINY, (A.D. 70 appr.). C. Plinius Secundus. 25:3:6:20.

PRINGLE, JOHN, (1776). Address to the Royal Society on announcing the award of the Copley Medal to Captain Cook R.N.

PURCHAS, SAMUEL, (1625). Hakluytus Posthumus or Purchas His Pilgrimes (Edition Hakluyt Society, 1905).

RAY, JOHN, (1686). Historia Plantarum.

REICHBORN-KJENNERUDS, I. (1940). Var Gamle Trolldomm-smedisin, III, (Old Norse witchcraft medicine), published in Skrifter utgitt av Det. Norske Videnskaps. Akademi i Oslo.

RIEU, E.V., (1945). Odyssey. Bk. 15.

RODAHL, K. (1944). Content of Vitamin C (l - Ascorbic Acid) in Artic Plants. Trans. Proc. Bot. Soc. Edin. XXXIV, 205.

RONSSEUS, BALDWIN, (1564). De magnis Hippocratis lien-ibus..... seu vulgo dicto scorbuto...etc.

SINCLAIR, JOHN, (1791). Statistical Account of Scotland.

SMITH, A.H. (1919). A historical enquiry into the effi-cacy of lime juice for the prevention and cure of scurvy. Journ. Roy. Army Med. Corps 32:93.

STOCKMAN, RALPH, (1926). James Lind and Scurvy. Edin. Med. Journ. 72, 343.

SURTEES SOCIETY, (1877). Publication No.68.
Selections from the Household Books of Lord William Howard.

THOMSON, FREDERICK, (1790). An Essay on the Scurvy.

THOMSON, G.S. (1937). Life in a Noble Household 1641-1700.

TREVELYAN, G.M. (1944). English Social History.

TROTTER, THOMAS, (1786). Observations on the Scurvy.
(1792). Observations on the Scurvy (2nd. Edition).
(1803). Medicina Nautica: An essay on the Diseases of Seamen comprehending the health in the channel.1799, 1800 and 1801.

WIER, JOHANNES, (1567). Medicarum observationum, lib. 1, de Scorbuto.

WOODALL, JOHN, (1617). The Surgeon's Mate.